

**B.Tech. - VIEP - MECHANICAL ENGINEERING
(BTMEVI)**

Term-End Examination

December, 2016

BIME-008 : MACHINE DESIGN - I

Time : 3 hours

Maximum Marks : 70

Note : Attempt any five questions. All questions carry equal marks. Use of scientific calculator is permitted. Use of Machine Design Data Book is permitted.

1. (a) Explain how the factor of safety is determined under steady and varying loading by different methods.

- (b) Design a helical compression spring for a maximum load of 1000 N and for a deflection of 25 mm. The maximum permissible shear stress for the spring material is 420 N/mm^2 . Modulus of rigidity is $0.84 \times 10^5 \text{ N/mm}^2$. Spring index is 6. 6+8

2. (a) Explain the difference between cotter and knuckle joints and give their uses.
- (b) Design a boiler joint for a steam pressure of 22 N/mm^2 . The inside diameter of the boiler is 1.25 metre and the desired efficiency of the longitudinal joint is 80%. 6+8
3. (a) How are the mechanical fasteners classified? Elaborate each type.
- (b) Explain various types of riveted joints giving specific applications of each type. 7+7
4. (a) What is the difference between a cotter and a key? State the advantages and limitations of a cotter joint.
- (b) Figure 1 shows the riveted joint with an eccentric load of 18 kN. The rivets are 25 mm in diameter. Find the maximum shear stress induced in the rivet. If the thickness of the plate is 15 mm, determine the crushing stress on the rivet. 6+8

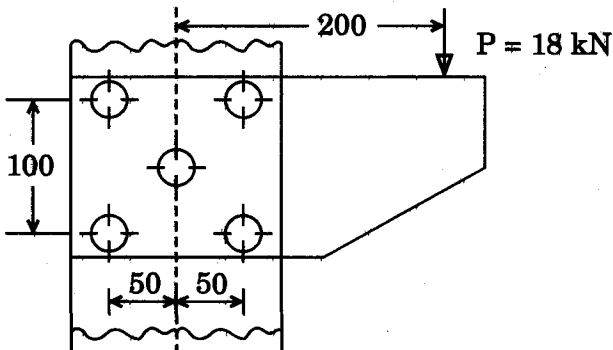


Figure 1

5. Design a bushed pin type flexible coupling to connect the output shaft of an electric motor to the shaft of a centrifugal pump. The motor delivers 20 kW power at 720 rpm. The starting torque of the motor may be assumed to be 150% of the rated torque.

14

6. (a) Why are tolerances provided on the dimensions of the machine components ? Explain different types of fit with suitable examples.

(b) A single start screw jack with 48 mm nominal diameter and pitch 40 mm is used to raise a load of 15 kN. The coefficient of friction between the screw and the nut is 0.12. Calculate the torque required to overcome friction while raising and lowering the load and determine the efficiency of the screw.

6+8

7. Write short notes on any *four* of following : $4 \times 3 \frac{1}{2} = 14$

- (a) Creep and fatigue considerations in designing machine element
- (b) Design for Rigidity
- (c) CAD and its advantages
- (d) Theories of Failure
- (e) Concurrent Engineering